REMARKS

Claims 12-20 have been examined. No claims have been amended. Examination of the claims in view of the following remarks is respectfully requested.

In the Office Action, the Examiner rejected the claims under 35 U.S.C. 103(a) in view of US 4,676,487 (Kudinov et al.). This rejection is respectfully traversed.

By way of background, the present invention relates to metallurgical vessels of the type used in metallurgical converters and basic oxygen furnaces. These vessels are typically suspended in a trunnion, and have a bottom portion which contains molten metal in use. The upper portion serves primarily as a splash guard. The extreme temperature conditions under which these structures function demand that various heat-ameliorating steps be taken. For example, historically, the top portion of the furnace was constructed of metal and lined with refractory material, with various disadvantages as set forth in the description of the prior art provided in the Kudinov et al. reference.

The structure of Kudinov et al. represents a step forward from this prior art, in that it provides a relatively inexpensive, long-lived structure which can serve as a portion of the upper furnace shell section. The advantage of Kudinov et al. consists of an internal cooling circuit notionally interposed between the metal and refractory of the prior art arrangement, which minimizes thermal stresses in the upper furnace shell and prolongs operating life.

The Kudinov et al. reference, and other teachings of this general nature, are those alluded to by the applicant in paragraph [0003] of the disclosure wherein reference is made to the approach of "attaching a cooling system directly to the vessel".

It is also known to implement heat-ameliorating measures in the context of the trunnion rings. A major problem recognized with these structures is cracking. To avoid cracking, it is known to run cooling fluid through the interior of the trunnion ring, as is admitted in paragraph [0003] of the disclosure.

The Examiner has indicated that, since the closest portion of any trunnion ring would be the most affected by thermal stresses, one of ordinary skill in the art at the time the

invention was made would have found it an obvious modification to use a cooling plate of the type described by Kudinov et al. for cooling the interior side of a trunnion ring.

With respect, this conclusion is faulty on several accounts.

Firstly, as indicated in paragraph [0003] of the disclosure, known systems have addressed the problems of thermal loading and stressing. As such, there exists no impetus from the standpoint of trunnion thermal loads to make special provision for the interior surface.

Secondly, even if persons of ordinary skill were to perceive shortcomings in terms of cooling performance in existing water-cooled trunnion rings, persons of ordinary skill in the art would manifestly not look to the Kudinov et al. reference for assistance, as this patent does not teach a plate adapted for cooling, but rather, teaches a cooled plate. That is, the plate of Kudinov et al. is intended to serve as a portion of the top shell section of a furnace, and is not intended to provide any cooling functionality to any adjacent part. That this is indeed intended is evident from column 2, lines 48-53, wherein it is stated:

> *It should be noted that in spite of a more intensive cooling of the metallic portion of the plate, the total heat lost by the cooling plate is decreased 1.4 to 1.5 times which fact leads to cutting down the consumption of fuel, e.g. coke in blast furnaces.*

To restate, it is clear from the advantage touted by Kudinov et al. that cooling of the surroundings is not the purpose of the plate, and indeed, Kudinov et al. view cooling of the surroundings as *something to be avoided, so as to reduce fuel requirements*. Thus, it would not be obvious for a person of ordinary skill in the art to utilize the plate of Kudinov et al. for the purpose of cooling an adjacent structure. The cooling system of Kudinov et al. is for self-preservation purposes, only, to prolong operating life *as a splash guard*.

Thirdly and finally, the conventional wisdom in the field of furnace construction is that interposition of water in close proximity to the vessel is dangerous, as indicated in column 1, lines 57-59, of US 5853656. Accordingly, even if persons of ordinary skill in the art would view the Kudinov structure as a cooling plate, such persons would not be inclined to position same on the inside surface of a trunnion ring, as same would bring the water therein into "dangerous" proximity to molten metal inside the vessel.

To summarize the foregoing, as at the date of the invention, persons of ordinary skill in the art perceived existing trunnion ring cooling technologies as providing satisfactory trunnion ring cooling performance. Accordingly, there existed no impetus for modification, and even if a person of ordinary skill in the art were drawn towards providing special cooling for the interior ring surface (which is denied, as persons of ordinary skill in the art attribute no special problem to that area), such persons would not position a plate of the Kudinov et al. type on the inner surface, as such a plate is not intended to provide cooling to adjacent structures, and moreover, such persons would tend to view the location of such a plate on the inside surface of a trunnion ring as dangerous.

In view of the above, it is manifest that the claimed structure possesses the requisite inventiveness to justify patent protection. The prior art structures serve as testament that prior practitioners in the field viewed the problem of trunnion cracking as primarily a matter of thermal stresses, and thus, attempted to resolve same through the use of relatively rigid "box"-type trunnions through which were passed large volumes of cooling water. This, in turn, necessitated the provision of yet more robust trunnions, so as to avoid the danger associated with the mixture of large volumes of water with molten metal. In contrast, the inventor herein has uniquely appreciated that trunnion cracking is a function of two important factors, namely, thermal stresses and trunnion rigidity, and has departed from the path of convention followed by his predecessors by providing a flexible (non-box) trunnion and a relatively small volume of water, to provide a structure that is:

- relatively resistant to cracking; the decreased trunnion "cooling" is offset by the increased trunnion flexibility, and
- safe; the increased "danger" associated with the interior location of the cooling is offset by the relatively small amounts of cooling water utilized

This novel structure provides numerous advantages over the prior art.

The flexible trunnion, for example, permits the use of an "open" structure (C-shaped in cross-section, for example) that is relatively inexpensive in comparison to the closed "box" trunnions used in the prior art.

Further, the trunnion flexibility permits same to flex in response to changes (thermal-induced and otherwise) in shape of the vessel, which adds longevity to both the vessel and the trunnion.

As well, the panel, which functions to absorb radiant heat emanating from the vessel before it impinges upon the trunnion, rather than drawing heat from the trunnion, permits larger vessels to be utilized in the trunnions; the smaller gaps between trunnion and vessel do not pose a problem, since the trunnion itself is no longer disposed towards reflecting heat back towards the vessel (which can create localized "hot spots" and shortened vessel life).

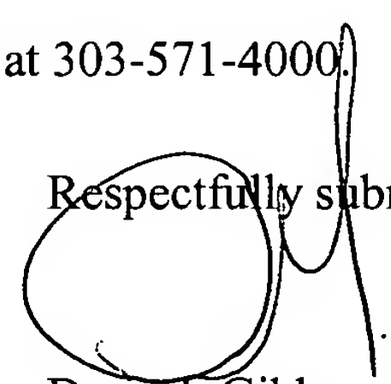
As such, it is respectfully requested that the §102 rejection of claims 12-20 be withdrawn.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,



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